

# NASA SCIENCE MISSION DIRECTORATE

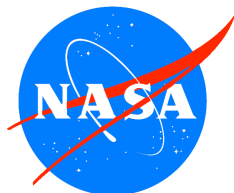
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*Earth Science Division  
Applied Sciences Program  
Homeland Security Program Element  
FY2007-2011 Plan*



FINAL DRAFT

Date: 11/10/2006



*Expanding and accelerating the realization of economic and societal  
benefits from Earth system science, information, and technology*

## **NASA Earth Science Division - Applied Sciences Program**

### *Homeland Security Program Element*

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The Applied Sciences Program websites contain additional information about the program and this program element:

Applied Sciences Program:	<a href="http://science.hq.nasa.gov/earth-sun/applications">http://science.hq.nasa.gov/earth-sun/applications</a>
Homeland Security Element:	<a href="http://science.hq.nasa.gov/earth-sun/applications/theme9.htm">http://science.hq.nasa.gov/earth-sun/applications/theme9.htm</a>
Project Tracking & Reporting	<a href="http://aiwg.gsfc.nasa.gov">http://aiwg.gsfc.nasa.gov</a>

## **NASA Science Mission Directorate – Applied Sciences Program**

### *Homeland Security Program Element Plan: FY 2007 - 2011*

#### **I. Purpose and Scope**

Each NASA Applied Sciences Program Element Plan is applicable for Fiscal Years 2007 through 2011. The plan documents the purpose of the program and the implementation approach to meet the program objectives using the allocated resources. The plan describes the program element approach in extending NASA Earth System Science research results to meet the decision support requirements of partner agencies and organizations. The Applied Sciences Program requires this plan to function as a program management tool, describing the program structure, functional mechanisms, performance measures, and general principles that will be followed in extending NASA research results for societal benefits.

The Homeland Security Program Element is one of twelve elements in the NASA Applied Sciences Program. NASA and the Applied Sciences Program collaborate with partner organizations to enable and enhance the application of NASA's Earth system science results to serve national priority policy and management decision support tools. The desired outcome is for partner organizations to use project results, such as prototypes and benchmark reports, to enable expanded use of NASA Earth system science products and to enhance their decision support capabilities.

The Science Mission Directorate Homeland Security Program Element is designed to advance the use of NASA's thirty Earth Science spacecraft missions and 100 sensors. NASA Earth system science results are expected to meet a number of homeland security needs. The Homeland Security Program Element extends products derived from Earth Science information, observations, data products, models, technology, and other capabilities into partners' decision support tools for homeland security issues of national priority. The Homeland Security Program addresses such areas of concern and decision-making as chemical, biological, nuclear, and radiological terrorism; geospatial enabling of homeland security operational; and national security issues. The Homeland Security Program focuses on decision tools related to the following classes of issues:

- Homeland security planning and decision support system strategies
- Interagency Modelling and Atmospheric Assessment Center (IMAAC), such as atmospheric transport and dispersion models
- Coordination with the National Response Plan with the U.S. Department of Homeland Security (DHS) and the Office for the Federal Coordinator for Meteorology (OFCM)
- Information technology, interoperability, and Web services
- Research and development of model and data assimilation and prediction
- Coordination with international security issues
- Economic management and "the built" environment (buildings and physical structures)
- Public response, recovery, mitigation, and welfare

The NASA Homeland Security (HS) Program Element works with NASA partners, federal agencies, and regional and national organizations that have homeland security responsibilities and mandates to support homeland security managers. Primary partners are the U.S. Department of Homeland Security (DHS), the Humanitarian Information Unit of the State Department, the Defense Threat Reduction Agency (DTRA), the Department of Defense (DOD), the National Oceanic and Atmospheric Administration (NOAA), the United States Environmental Protection Agency (EPA), the Department of Energy (DOE), the Nuclear Regulatory Commission

(NRC), and the U.S. Department of Agriculture (USDA). The NASA HS Program includes collaboration with US parties and international organizations.

NASA Homeland Security Program Element activities relate to other national priority Program Elements including Public Health, Agricultural Efficiency, Disaster Management, Aviation, Air Quality, and Energy Management. Through its activities, the Program provides results that support the White House Committee on Environment and Natural Resources (CENR), OFCM, the Federal Committee for Meteorological Services and Supporting Research (FCMSSR) and the interagency programs on Climate Change Science and Technology (CCSP, CCTP).

Priority NASA Earth observing missions for the Homeland Security Program include Terra, Aqua, Quick Scatterometer (QuikSCAT), CloudSAT, Tropical Rainfall Measuring Mission (TRMM), National Polar-orbiting Operational Environmental Satellite System (NPOESS), NPOESS Preparatory Project (NPP), Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO), and Gravity Recovery and Climate Experiment (GRACE). Future missions include National Polar-orbiting Operational Environmental Satellite System (NPOESS), Global Precipitation Mission (GPM) and Interferometric Synthetic Aperture Radar (InSAR).

Priority atmospheric transport models include the EPA's Aerial Locations of Hazardous Atmospheres (ALOHA®), NOAA's Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT), and Lawrence Livermore National Laboratory's Lagrangian Operational Dispersion Integrator (LODI). Meteorology models include the Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5), the Weather Research and Forecasting Model (WRF), the National Center for Environmental Prediction Event Tree Analysis (ETA) model, and the Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS), among others. Other models of importance to the Homeland Security Application consist of water flow and contaminant transport models.

NASA's role in air transport and dispersion models will be to bridge the gap from mesoscale to microscale/urban scale. This was identified as an important need in the Office of Federal Coordinator for Meteorology (OFCM) report: "Federal Research and Development Needs and Priorities for Atmospheric Transport and Diffusion Modeling".

The project plans associated with the Homeland Security Program designate specific sensors and models, and they state specific partnership activities to extend science measurements, environmental data records, and geophysical parameters.

This plan covers objectives, projects, milestones, and activities for FY 07-011. In FY05, the Program's priorities focus on extending NASA research results to support the Interagency Modeling and Atmospheric Assessment Center (IMAAC) at the Department of Homeland Security (<http://www.dhs.gov>). This work will continue with expansion into aquatic or hydrologic dispersion needs related to terrorism on the Nations water systems and coastal areas.

## II. Objectives: FY2007-2011

The goal of the Homeland Security Program is as follows:

Enable partners' beneficial use of NASA Earth Science research, observations, models, and technologies to enhance decision support capabilities serving their homeland security responsibilities. Major tenets of the Homeland Security Program's goals include the following:

- Develop and evolve a network of partnerships with appropriate homeland security organizations, both internal and external to DHS
- Identify and assess partners' homeland security responsibilities, plans, and decision support tools and evaluate the capacity of NASA science results to support these partners
- Validate and verify applications of results with partners, including development of products and prototypes to address partners' requirements
- With partners, document the value of Earth-Sun System science results in decision support tools and support the tools' transition from research to operations.
- Communicate results and partners' achievements to appropriate homeland security communities, committees, and stakeholders

Specifically, the Homeland Security program pursues the following short- and near-term objectives:

### Short-term Objectives (FY07)

Participate in the IMAAC Interagency Working Group to establish the suite of NASA observations, science results and data products that can contribute to IMAAC goals including improved modeling accuracy over a range of urban to regional scales. Include aquatic security needs such as river and coastal contamination due to radiological, biological, or nuclear terrorism.

Expand upon current food security issues from the Decisions 05 supplemental projects and include international food security issues that destabilize international security.

### QI - II 2007

- Encourage support and utility of InSAR spacecraft observations in support of homeland security.
- Evaluate aquatic security needs.

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### QIII - IV 2007

- Tasks for QIII - IV 2007.

Add water transport and dispersion applications to enhance DHS waterborne security issues, including rivers, lakes, reservoirs and coastal zones. Begin the process to RPC Aquarius data or other relevant satellites and sensors.

Develop food security (insecurity) project collaboration with USDA Homeland Security as a result of Decisions 04 augmentation project.

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#### Near-term Objectives (FY08-FY11)

2008

- Complete benchmark reports and conduct results conferences on at least two separate homeland security issues and corresponding decision support tools using NASA research and pathfinder missions observations and predictions for model capacity.
  - Benchmark through RPC if possible new mission observations from at least two sensors (NPOESS, GPM, InSAR) as they become “operational” for homeland security applications. Food security includes agricultural security needs as well as food production, transport, and storage.
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2009

- Tasks for FY 2009.

Assist in future DHS needs as related to their long term strategy and Near Term Opportunities (NTO) of GEO. One such task is to improving infrastructure protection of border control facilities. NASA can contribute to coastal change detection that will allow for improved border security from human and natural disasters.

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2010

- Tasks for FY 2010.

Support improvements to DHS Homeland Security data management needs, such as interoperability, data standards, data access, and data services, work with NASA GIO and OSTP/GEO Data Management issues.

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2011

Continue and expand the needs of Homeland Security in air transport, food, and water security as new sensors are launch.

- Tasks for QIII - IV 2011.

Sensorweb containing NASA airborne and satellite resources were demonstrated in the REASoN WRAP project. How these technologies can be developed for Homeland Security will be evaluated.

### **III. Homeland Security Issues, Related Research, and Decision Support Tools**

Potential Homeland Security Issues: FY07-FY11

The Homeland Security Program authorizes studies, working group participation, program reviews, and other endeavors to ensure the Program's overall success.

Activity: State Department Partnership, Humanitarian Information Unit (HIU)

Purpose: To implement a DSS for the State Department's HIU. The HIU is interested in the Public Health and Homeland Security Programs and in the application of science results and spacecraft missions, as well as in geospatial observations issues and interoperability. This partnership also enhances homeland security applications related to population monitoring.

Managers: Steve Ambrose, Bruce Davis

Homeland Security-related Research

Research in air quality, agriculture, invasive species, public health, and aviation all support the needs of Homeland Security.

Priority Decision Support Tools

Homeland Security Presidential Directive #5 (HSPD-5) assigns the Secretary of the Department of Homeland Security the role of principal Federal Official for Domestic Incident Management. To execute the responsibilities associated with this role, the Department of Homeland Security needs near-real-time information to build a common operating picture. DHS has clearly stated its need for a single point of contact for all-hazards dispersion modeling, which is the prediction of the dispersion (including transport and diffusion) of any contaminant in the environment. The Homeland Security Operations Center (HSOC, a.k.a. Watch Center) and other elements of DHS require timely and accurate weather and the capacity to model air plume forecasts of contaminant dispersion for all types of incidents and accidents. A key component of implementing this directive is IMAAC. The IMAAC directly supports the HSOC (Watch Center) and other elements of DHS and is the single source of atmospheric transport and dispersion (ATD) prediction information for chemical, biological, radiological, and nuclear (CBRN) incidents or threats. This center provides tailored all-hazards dispersion support to DHS and its HSOC. The primary and most urgent objective is to provide the best available information for atmospheric hazard predictions so that DHS can make appropriate emergency response and consequence management decisions.

IMAAC ATD predictions can benefit from a suite of observations, data products, and data assimilation products associated with NASA missions generally used for research of weather observations, climate, oceans, terrestrial hydrology, ecology, and the cryosphere. Current missions include TRMM, Terra/Aqua/Aura, CloudSAT, QuikSCAT, EO-1, and Landsat, although future missions may include NPOESS, GPM and InSAR. Data products from these missions are archived at various Distributed Active Archive Centers (DAACS) located throughout the country. Additional NASA data products can be tailored to accommodate the IMAAC DS models. The focus of the Homeland Security Program Element at NASA is to ensure that NASA's science results and missions are integrated into solutions for the benchmark capacity of the IMAAC and HSOC activities early in their formulation stages.

## IV. Project and Activities

The program consists of functional elements that contribute to all of the National Applications activities. The intention is to have the performance of these functions leverage accomplishments, and therefore the apparent resource investment, to the greatest extent possible into the National Applications partnerships. These functions are: Geoscience Standards and Interoperability, Human Capital Development, Integrated Benchmark Systems, and Solutions Networks. Examples of leveraged activities are:

- The Earth Science Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.
- A Solutions Networks capability to discover candidate configurations of NASA research results with the potential to improve partner's decision support systems.
- A Rapid Prototyping Capability to support NASA and partners in reducing uncertainty and testing the validity of NASA research results in decision support tools.
- Systems integration capability, knowledge tools and skilled human capital to help conduct studies on the systematic transitioning of the results of research to operational uses and the capability of operational systems to support scientific research.
- A student-based, human capital development program for building capability in entry level participants in the community of practice while developing solutions for state and local applications.

### A. Solicited Projects

All National Applications Program Elements authorize peer-reviewed projects to support each element's goal and objectives. To secure funding and authorization to undertake activities supporting NASA and the Applied Sciences Program, project teams are responsible for developing project plans and managing the activities. The project plans specify the Earth Science observations, models, and other research results to extend to decision support tools as well as the activities to produce appropriate deliverables. The plans integrate contributions from appropriate the partners, NASA Centers and other contributors from the community of practice. Projects are expected to extend the benefits of NASA research results to the maximum extent possible, including the use observations from sensors on: Aura, Terra, Aqua, TRMM, NPP, NPOESS, Hydros, Topex, Jason, OCO and Aquarius.



Project: Integration of Earth Science Results with Pest Forecasting and Risk Management Decision					Solicitation	
<p><b>The purpose of this project is to assess the potential for Crop Monitoring to improve the performance of USDA, DHS’s Crop monitoring operation used in improve detection of crop terrorism for secure food supply for the Nation.</b></p> <p>This project focuses on food security, in which there is a large gap in the current Homeland Security program. However, there's a need to switch focus from soybean rust (which should be accomplished fairly easily) to another topic. Soybean rust is a known problem in American agriculture and steps are being taken by the USDA to control it. he University of Minnesota and its partners have been awarded \$15 million by the Department of Homeland Security over the course of the next three years for the Homeland Security Center for Food Protection and Defense, which will address agro-security issues related to post-harvest food protection. The University of Minnesota's team includes partnerships with major food companies as well as other universities.</p>					Budget (\$K)	
					FY07	0
Project Monitor and Center	Other NASA Centers	Timeframe	Partners	FY08	0	
Rodney McKellip SSC		FY05 - FY06	USDA	FY09	0	
				FY10	0	
				FY11	0	
Principal Investigator(s)				Other Apps.		
Earth Science Products	mission: Precipitation, wind data, Landsat, Terra, Aqua, QuikSCAT, TRMM, GIFTS, NPOESS sensor: products: models:					
Deliverables	Description		End Date	IBPD Metric #		
	Project Plan					
	Evaluation Report					
	Design & Implementation					
	Verification & Validation					
	Benchmark Report					

Project: University of San Diego - A Border Security Decision Support System Driven by Remotely Sensed Data Inputs					Solicitation	
The purpose of this project is to assess the potential for Land Use/Land Cover to improve the performance of DHS’s Border Security Decision Support System used in improved border control information for The Nation's security.  REASoN Project: In final year. Datasets used with the program are MODIS, ASTER, Global Positioning System, AVHRR, GOES. Models used in this project are Terrain, Visibility, Vegetation, Wildfire, and Weather. User organizations are the Department of Homeland Security, First Responders, and Border Agents. This is a five-year project with total cost of \$1,838,000 (FY03- 07). The PI is Doug Stow, San Diego State University.				Budget (\$K)		
				FY07	368	
Project Monitor and Center	Other NASA Centers	Timeframe	Partners	FY08	0	
Bruce Davis SSC		FY03 - FY07	DHS, Border Agents and First Responders	FY09	0	
				FY10	0	
				FY11	0	
Principal Investigator(s)				Other Apps.		
Earth Science Products	mission: MODIS, ASTER, Global Positioning System, AVHRR, GOES					
	sensor:					
	products:					
Deliverables	Description		End Date	IBPD Metric #		
	Project Plan		10/1/2005			
	Evaluation Report		3/31/2005			
	Design & Implementation					
	Verification & Validation		6/30/2007			
	Benchmark Report		9/30/2007			

Project: An Integrated LES Modeling System for Atmospheric Dispersion of Toxic Agents: Homeland Security Applications					Solicitation	
<p><b>The purpose of this project is to assess the potential for MODIS, ASTER, and MM5/WRF modeling to improve the performance of Alabama Department of Homeland Security and Army Missile Research, Development, and Engineering Center’s IMAAC used in Large Eddy Simulation modeling improvements for improved ATD monitoring for homeland security.</b></p> <p>Decisions 05 Project: 1) Incorporates QuikSCAT, AMSR-E, &amp; MODIS data; NOAA, WRF, and other products to improve the calculation of contaminant concentrations and dosage. 2) Incorporates MODIS &amp; ASTER data, MM5/WRF model, and HYSPLIT dispersions into the Regional Atmospheric Modeling System in LES mode to support the Information Fusion Cell (IFC) and Force Protection Operational Requirements Testbed (FORT) decision support tools.</p>				Budget (\$K)		
				FY07	265	
Project Monitor and Center	Other NASA Centers	Timeframe	Partners	FY08	242	
Udaysankar Nair		FY05 - FY08		FY09	0	
				FY10	0	
				FY11	0	
Principal Investigator(s)				Other Apps.		
Earth Science Products	mission: QuikSCAT, AMSR-E, & TERRA/AQUA sensor: MODIS products: models: WRF/MM5, RAMS, HYSPLIT					
Deliverables	Description		End Date	IBPD Metric #		
	Project Plan					
	Evaluation Report					
	Design & Implementation		1/1/2007			
	Verification & Validation		10/1/2007			
	Benchmark Report		10/1/2008			

Project: Integrating NASA Earth Science Capabilities into the IMAAC for Improvements in Atmospheric Transport and Dispersion Modeling					
The purpose of this project is to assess the potential for Land Use and Land Cover Products to improve the performance of DHS’s IMAAC used in Advanced Plume modeling, hazard predictions for Homeland Security for exposed populations.  Decisions 05 ROSES project award. This project is described in more detail in the directed project area of this Program Element Plan. This work continues the incorporation of surface roughness characteristics into the IMAAC operations.				Budget (\$K)	
				FY07	329
Project Monitor and Center	Other NASA Centers	Timeframe	Partners	FY08	335
Bruce Davis SSC	GSFC	FY07 - FY09	LLNL, U. of Ca.	FY09	342
				FY10	
				FY11	
Principal Investigator(s)				Other Apps.	
Earth Science Products	mission: Terra, Aqua, ASTER LandSAT sensor: MODIS LAI, VIIRS, Lidar products: Surface Roughness, 3-d plume product models: LODI ADAPT COAMPS Eta				
Deliverables	Description		End Date	IBPD Metric #	
	Project Plan		5/1/2006		
	Evaluation Report		9/1/2006		
	Design & Implementation		10/1/2007		
	Verification & Validation		10/1/2007		
	Benchmark Report		11/1/2008		
	Validate Roughness Fields		10/1/2007		
	Compute Roughness Maps		10/1/2008		
	Benchmark/Integration		10/1/2009		
					Air Quality, Public Health, Agriculture, Ecological Forecasting, Aviation, Disaster Management

Project: Integration of Earth Science Results with Pest Forecasting and Risk Management Decision					
<p><b>The purpose of this project is to assess the potential for Land Use and Land Cover Products to improve the performance of DHS’s Food Security used in Evaluate specific projects and partner with DHS for improved pest and food security monitoring.</b></p> <p>This project focuses on food security, in which there is a large gap in the current Homeland Security program. However, there’s a need to switch focus from soybean rust (which should be accomplished fairly easily) to another topic. Soybean rust is a known problem in American agriculture and steps are being taken by the USDA to control it. So there is no need to continue research in ways to detect this problem. In addition, there’s a desire to help build capability beyond land-cover analysis so there needs to be some negotiation on the types of observations applied and the use of Earth science models in their work.</p> <p>The future of this project is dependent upon how successful the investigators are in bidding on ROSES 07 in the 2007 time frame.</p>				Budget (\$K)	
				FY07	0
Project Monitor and Center	Other NASA Centers	Timeframe	Partners	FY08	0
George May SSC	GSFC	FY06 - FY07	ITD, Kansas State University, DHS	FY09	0
				FY10	0
				FY11	0
Principal Investigator(s)				Other Apps.	
Earth Science Products	mission: Terra, Aqua, ASTER LandSAT				
	sensor: MODIS LAI, VIIRS, Lidar				
	products: Surface Roughness, 3-d plume product				
		models: LODI ADAPT COAMPS Eta			Air Quality, Public Health, Agriculture, Ecological Forecasting, Aviation, Disaster Management
Deliverables	Description		End Date	IBPD Metric #	
	Project Plan (Dependent on Award)				
	Evaluation Report				
Notes: Project received \$250K in FY06. The project is still underway and will produce results in FY07 in terms of a partnership and evaluation. The project was funded as a supplemental project with opportunity but it will depend on other funding mechanisms if it is to continue. Directed funding is being considered.					

## B. Directed Projects

The program supports directed projects to serve issues of critical strategic and tactical importance, including near-term opportunities with potential for high-return in developing relationships with partner organizations and where timeliness is critical to maintain.

Project: IMAAC (Also in collaboration with LLNL Decisions 05 Project)					Directed Project	
<p>To utilize Earth-Sun system results that enhance air plume hazards observation and prediction capabilities with remote sensing and model development. To better understand aerosol production (air quality), movement, and development using NASA earth observations and modeling techniques</p> <p>Goals: Air plume model/module improvements for preparedness and mitigation, with development as a response tool for the HSOC/IMAAC situation center. To improve use of science inputs from NASA remote sensing technologies, such as TRMM, QuikSCAT, and MODIS, for air plume applications. To bring weather analysis, models, and prediction into homeland security applications at the IMAAC. To evaluate the potential of incorporating other land and atmospheric quantities produced by NASA into the IMAAC models.</p>				Budget (\$K)		
				FY07	550	
Project Manager and Center	Other NASA Centers	Timeframe	Partners	FY08	600	
Shahid Habib Bruce Davis Mike Jasinski	SSC, GSFC	FY07 - FY11	DHS, FEMA, EPA, NOAA, DOE, NRC,Navy	FY09	800	
				FY10	0	
				FY11	0	
Principal Investigator(s)						
Earth Science Products	mission: Landsat, Terra, Aqua, Aura, ASTER, QuikSCAT, TRMM, NPP, NPOESS, AVHRR, GOES, GPM			Other Apps.		
	sensor: MODIS, Hyperspectral					
	products:			Air Quality, Aviation, Agriculture, Water Management, Coastal Management		
	models: ALOHA, HYSPLIT, LODI, COAMPS, WRF					
Deliverables	Description	End Date	IBPD Metric #			
	Project Plan (Air and Water Plans)	11/1/2006				
	IMAAC Evaluation Report	9/30/2006				
	Design & Implementation	12/1/2006				
	IMAAC Verification & Validation Report	11/30/200				
	IMAAC Benchmark Report	3/31/2008	6ASP09.A, 09.			
	IMAAC Results Conference	9/30/2008				
	IMAAC Water Evaluation	7/1/2007				
	IMAAC Water V&V	8/1/2008				
	IMAAC Water Benchmark	9/1/2009				

*Notes:*

Funding will be split between GSFC and SSC on this project \$200K for GSFC and \$350K for SSC for the IMAAC LLNL work, Food Security, and Aquatic evaluation work.

Goal: To work with the Decisions 05 CAN to provide surface roughness characteristics to that proposal.

To develop a hydrologic/aquatic plume dispersion enhancement to DHS water monitoring capabilities using NASA research results. This will be a new activity for Homeland Security. It will work with the requirements of the IMAAC, coordinate with such agencies as NOAA Coastal Hazards (NOAA Coastal Services Center) and even relate to inputs of the Disaster Management Program for AWIPS-II enhancements.

To develop a food security E, V&V, and Benchmark as a continuation of the Decisions 04 project on Food Security with ITD. This project, although not an IMAAC related project will use available funds to finish the work of the ITD one year augmentation in creating final reports.

Bruce Davis, Mike Jasinski and others are involved in this IMAAC project. The surface roughness characteristics developed in this project carry on with the LLNL awarded project under Decisions 05. A new project plan has been received as of 8/19/2006.

Since Hydrologic dispersion issues of CRBN will eventually become the responsibility of the IMAAC, we will begin the evaluation of water borne willful threats to water supply and coastal areas through this first year evaluation phase.

**C. Congressionally-Directed Activities**

The program oversees Congressionally-directed activities associated with homeland security issues. The project teams for Congressionally-directed activities are responsible for developing, managing, and reporting on technically-credible and appropriately-budgeted projects aligned with the NASA Applied Sciences Program objectives. The Homeland Security program team interacts with the recipients to align their activities appropriately and facilitates interaction with the program's partners and other investigators.

Project: MRC-IDQ - Application of Remote Sensing Data for Enhancing Radiation Detection and Mapping Tools					Congressionally Mandated	
Application of Remote Sensing Data for Enhancing Radiation Detection and Mapping Tools. The objective of the Eagle Eyes research program at the U. of S. Mississippi is to develop sensor systems and advanced signal processing methods for extended range detection of radioactive materials. The objective is to be accomplished through the verification and characterization of radiation induced atmospheric effects.				Budget (\$K)		
				FY07	402	
Project Manager and Center	Other NASA Centers	Timeframe	Partners	FY08	0	
Mark Gloriso	SSC	FY07 - FY08	USM	FY09	0	
				FY10	0	
				FY11	0	
Principal Investigator(s)				Other Apps.		
Earth Science Products	mission: Aura					
	sensor: HIRDLS, MLS, TES, OMI					
	products: SO2, NO3, O3, NO2					
	models: WRF, pollution, tracking					
Deliverables	<u>Description</u> <u>End Date</u> <u>IBPD Metric #</u>					
	Project Plan					
	Evaluation Report					
	Design & Implementation					
	Verification & Validation					
	Benchmark					



## V. Program Management & Crosscutting Solutions Support

### A. Program Management Activities

The Homeland Security program conducts activities that contribute to the overall management, advocacy, and success of the program. Activities include studies and assessments in informal planning, interagency working group participation, publications and journal articles, support for conferences and workshops, program team meetings, and other related endeavors.

Project: State Department Partnership, Humanitarian Information Unit (HIU)				Project Management	
To implement a DSS for the State Department's HIU. The HIU is interested in the Public Health and Homeland Security Programs and in the application of science results and spacecraft missions, as well as in geospatial observations issues and interoperability. This partnership also enhances homeland security applications related to population monitoring.				Budget (\$K)	
				FY07	0
Project Manager and Center	Other NASA Centers	Timeframe	Partners	FY08	0
Steve Ambrose	HQ (lead), SSC	-	HIU	FY09	0
				FY10	0
				FY11	0
Principal Investigator(s)				Other Apps.	
Earth Science Products	mission:				
	sensor:				
	products:				
		models:			
Deliverables	Description		End Date	IBPD Metric #	
	Evaluation Report				
	Verification & Validation Report				
	Benchmark Report				
	DSS for HIU				

**B. Crosscutting Solutions Support**

The Homeland Security program works with the Crosscutting Solutions Element within the Applied Sciences Program to develop project concepts and enable homeland security objectives. The program expects to pursue the following activities with the four Crosscutting Solutions sub-elements:

*Integrated Benchmark Solutions*

FY07:

FY08:

FY09:

FY10:

FY11:

*Solutions Networks*

*DEVELOP*

FY07:

FY08:

FY10:

*GIO*

FY07:

FY08:

FY09:

FY10:

FY11:

**VI. Budget: FY07-11**

The following table lists the Homeland Security Program budget for FY2007 - FY2011:

<b><u>Project</u></b>	<b><u>FY07</u></b> <b><u>(\$K)</u></b>	<b><u>FY08</u></b> <b><u>(\$K)</u></b>	<b><u>FY09</u></b> <b><u>(\$K)</u></b>	<b><u>FY10</u></b> <b><u>(\$K)</u></b>	<b><u>FY11</u></b> <b><u>(\$K)</u></b>
Integration of Earth Science Results and Pest Forecasting and Risk Management Decision	0	0	0	0	5
University of San Diego - A Border Security Decision Support System Driven by Remotely Sensed Data Inputs	368	0	0	0	0
An Integrated LES Modeling System for Atmospheric Dispersion of Toxic Agents: Homeland Security Applications	265	242	0	0	0
Integrating NASA Earth Science Capabilities into the IMAAC for Improvements in Atmospheric Transport and Dispersion Modeling	329	335	342	0	0
Integration of Earth Science Results with Pest Forecasting and Risk Management Decision	0	0	0	0	0
IMAAC (Also in collaboration with LLNL Decisions 05 Project)	550	600	800	0	0
MRC-IDQ - Application of Remote Sensing Data for Enhancing Radiation Detection and Mapping Tools	402	0	0	0	0
State Department Partnership, Humanitarian Information Unit (HIU)	0	0	0	0	0
<b>Total = \$</b>	<b>1914</b>	<b>1177</b>	<b>1142</b>	<b>0</b>	<b>5</b>

## VII. Schedule and Milestones for Homeland Security

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
Integration of Earth Science Results with Pest Forecasting and Risk Management Decision	FY05	Project Plan	
		Evaluation Report	
		Design and Implementation	
		V&V	
		Benchmark Report	

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
University of San Diego - A Border Security Decision Support System Driven by Remotely Sensed Data Inputs	FY03	Project Plan	10/1/2005
		Evaluation report	3/31/2005
		Design and Implementation	
		V&V	6/30/2027
		Benchmark Report	9/30/2007

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
An Integrated LES Modeling System for Atmospheric Dispersion of Toxic Agents: Homeland Security Applications	FY05	Project plans	
		Evaluation report	
		Design and Implementation	1/1/2007
		V&V	10/1/2007
		Benchmark report	10/1/2008

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
Integrating NASA Earth Science Capabilities into the IMAAC for Improvements in Atmospheric Transport and Dispersion Modeling	FY07	Project Plan	5/1/2006
		Evaluation Report	9/1/2006
		Design and Implementation	10/1/2007
		V&V	10/1/2007
		Benchmark report	11/1/2008
		Validate Roughness Fields	10/1/2007
		Compute Roughness Maps	10/1/2008
		Benchmark/Integration	10/1/2009

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
Integration of Earth Science Results with Pest Forecasting and Risk Management Decision	FY06	Project plan (dependent on	
		Evaluation report	

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
IMAAC (Also in collaboration with LLNL Decisions 05 Project)	FY07	Project plan (Air and Water	11/1/2006
		IMAAC Evaluation report	9/30/2006
		Design and Implementation	12/1/2006
		IMAAC V&V report	11/30/2007
		IMAAC Benchmark report	3/31/2008
		IMAAC Results Conference	9/30/2008
		IMAAC Water Evaluation	7/1/2007
		IMAAC Water V&V	8/1/2008
		IMAAC Water Benchmark	9/1/2009

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
MRC-IDQ - Application of Remote Sensing Data for Enhancing Radiation Detection and Mapping Tools	FY07	Project Plan	
		Evaluation Report	
		Design and Implementation	
		V&V	
		Benchmark	

<i>Project</i>	<i>Start Date</i>	<i>Deliverable</i>	<i>End Date</i>
State Department Partnership, Humanitarian Information Unit (HIU)	FY07	Evaluation Report	
		V&V Report	
		Benchmark Report	
		DSS for HIU	

## **VIII. Program Measures**

The Homeland Security Management Team uses performance measures to track progress, to identify issues, to evaluate projects, to make adjustments, and to establish results of the Program Element. These measures serve as condition indicators to help monitor progress within and across specific project activities to ensure that the Program meets its goals and objectives. The Management Team continually analyzes these measures, tracking conditions and identifying issues to keep the Program aligned with this Plan to meet its objectives.

The Program uses two performance measures: Program Management measures assess activities within the Program, and Performance measures assess whether external program activities are serving their intended purpose. The Applied Sciences Program also uses this information in preparing IBPD directions and U.S. Office of Management and Budget (OMB) Program Assessment Rating Tool (PART) responses.

### **Program Management Measures (Internal)**

#### **Inputs:**

- 1) Potential issues and DSTs identified for Homeland Security – number, type, range
- 2) Eligible partners to collaborate with – number, type, range
- 3) Potential results/products identified to serve Homeland Security – number, type, range

#### **Outputs:**

- 1) Assessments or evaluations of DSTs – number, range
- 2) Assessments of Earth Science results/products to serve DSTs – number, range
- 3) Agreements with partners – presence
- 4) Reports (evaluation, validation, benchmark) – number, type

#### **Quality and Efficiency:**

- 1) Science results/products – number used per DST, ratio of utilized to potential
- 2) Agreements – ratio of agreements to committed partners
- 3) Reports – partner satisfaction, timeliness, time to develop
- 4) Reports – ratio of validations to potential products, ratio of benchmarks to validations

### **Performance Measures (External)**

#### **Outcomes:**

- 1) Science products adopted in DSTs – number, type, range; use in DST over time
- 2) Science products in use – ratio of products used by partners to reports produced
- 3) Partner and DST performance – change in partner DST performance, number & type of public recognition of use and value of Earth Science data in DST

#### **Impacts:**

1) Partner value – change in partner metrics (improvements in value of partner decisions)

In addition to the stated measures, the Homeland Security Program periodically requests an assessment of its plans, goals, priorities, and activities through external review. The Homeland Security Program team uses these measures, along with comparisons to programmatic benchmarks, to support assessments of the Science Applied Sciences Program (e.g., internal NASA reviews and OMB PART). Specifically, the Homeland Security Program manager uses comparisons to similar activities in the following programs (i.e., program benchmarks) to evaluate its progress and achievements:

- Environmental and Societal Impacts Group at the National Center for Atmospheric Research (NCAR)
- Global Monitoring for Environment and Security (GMES)

FY05 Performance Measures - IBPD

This Program serves the following IBPD Performance Measures for FY04 and FY05:

Outcome 3.1.1: By 2012, in partnership with the Department of Homeland Security, the Department of Defense, and the Department of State, the Applied Sciences Homeland Security Program will deliver fifteen observations and five model predictions for climate change, weather prediction, and natural hazards to five national and five global organizations and decision makers to evaluate five scenarios and to optimize the use of Earth resources (e.g., food, water, energy) for homeland, environmental, and economic security.

Goal 5ESA9: The Homeland Security Program will benchmark the use of predictions from two Earth Science models (including the Goddard Institute for Space Studies (GISS) 1200 and National Centers for Environmental Prediction (NCEP) numerical weather prediction models such as ETA) for use in national priorities, such as National Security, and for support of the CCSP, and the CCTP, and the NOAA National Weather Service.

FY06

The Homeland Security Program cuts across many of the Applied Sciences Program's National Applications. Weather and climate play a major role in Homeland Security activities, including air quality monitoring. NASA's Homeland Security Program works directly with the DHS (IMAAC) for air plume modeling.

## **Appendix A: Program Element Partners**

### **A. Program Management**

Homeland Security Program Manager:

Stephen Ambrose,  
NASA-Headquarters

Responsibilities:

- Program development, strategy, plans, and budgets
- Program representation, advocacy, and issues to Applied Sciences management and beyond
- Communication of Earth Science priorities and directives to Homeland Security Program team/network
- Implementation of interagency agreements and partnerships
  - Monitoring of Homeland Security Program metrics and performance evaluation

Deputy Program Manager

Dr. Shahid Habib, GSFC

Responsibilities:

- Leadership on project plans, development, performance, and partnership relationships in collaboration with the IMAAC.
- Communication of project metrics, performance, status, and issues to Program Manager
- Coordination between NASA Centers on Homeland Security
- Leadership on project plans, development, performance, and partnership relationships
- Communication of project metrics, performance, status, and issues to Program Manager
- Leadership and communication to Homeland Security Program team and network
- Coordination between NASA Centers on Homeland Security Program activities

### **B. Homeland Security Network & Partners**

The program element maintains a network of organizations and points-of-contact associated with Homeland Security activities.

International, National and Regional Organizations Partners:

Climate Change Technology Program (CCTP) – The OFCM Joint Action Group (JAG) Applied Sciences Program leads the CCTP group on measurements and monitoring. The Homeland Security program supports this effort.

Climate Change Science Program (CCSP) – Joint federal program of the President’s Committee on Climate Change Science and Technology Integration has issued its strategic plan to address some of the most complex questions and problems dealing with long-term global climate variability and change.

CENR Homeland Security Committee (and associated Working Groups) – Office of Science and Technology Policy (OSTP) subcommittee and joint effort from all Federal Agencies.

Geospatial One Stop (GOS) – GIO collaboration to bring interoperability to the federal community.

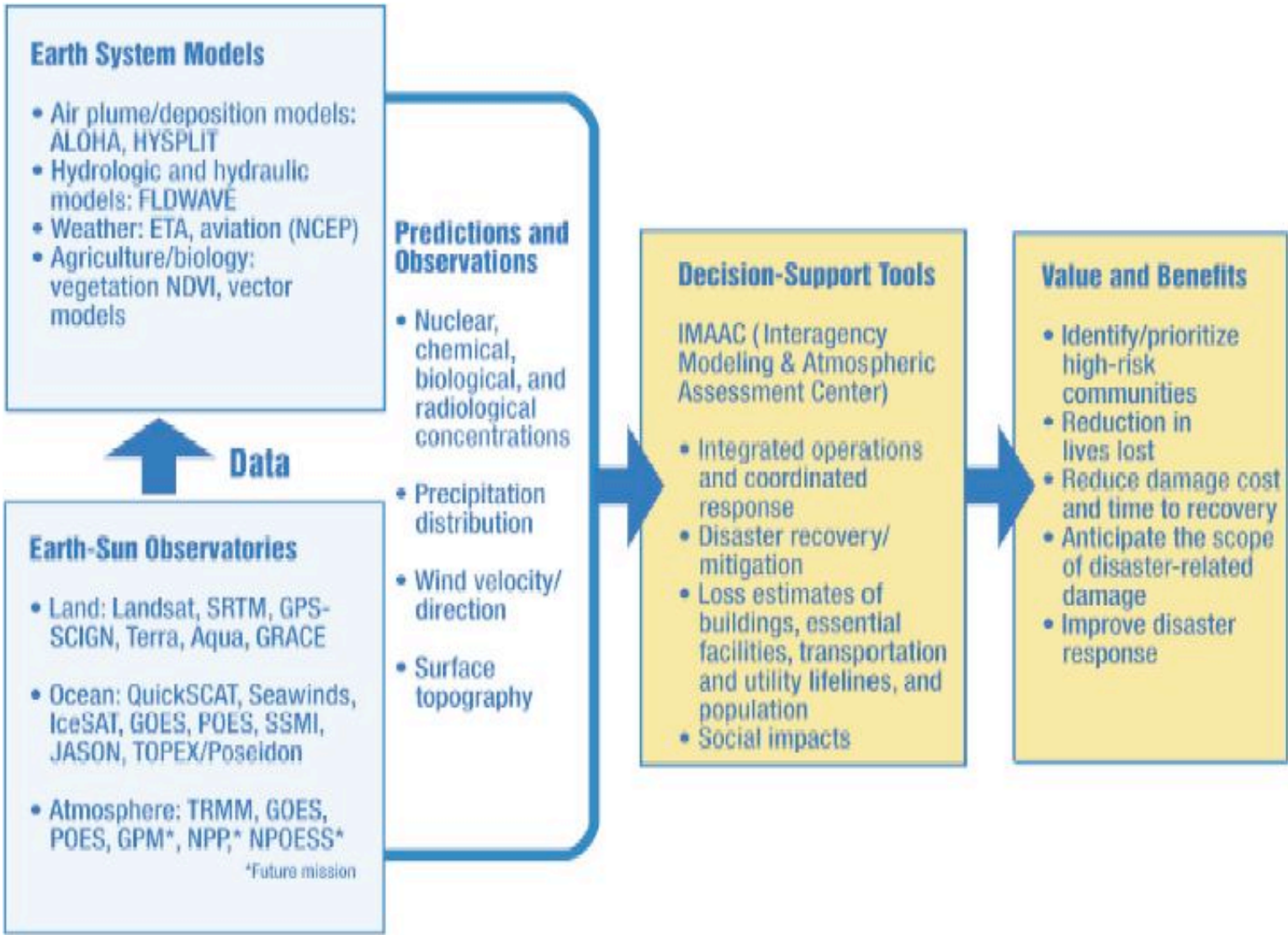
Federal Geographic Data Committee (FGDC)

Homeland Security Committee – the Homeland Security Program participates in the standards committee for Homeland Security and Geographic Information, map symbology, and other Homeland Security standards being developed under the FGDC.



## Appendix B: Roadmap

The figure below illustrates how science measurements, model products, and data fusion techniques support the Homeland Security Program's partners and their decision support tools and shows the value and benefits of science to society.



## B. Roadmap

The Homeland Security Roadmap was developed in collaboration with the Earth Science Division's Research and Analysis Program Plan to ensure that the priorities of science results are carried forward to homeland security applications that utilize the investment of science research and technology. For example, a better understanding of air plume chemistry and deposition would greatly benefit Homeland Security's air plume modeling needs. Parameter modeling at the global scale can greatly improve information quality at the local and regional scales.



## Appendix C: Acronyms

AIWG	Applications Implementation Working Group
ALOHA	Aerial Locations of Hazardous Atmospheres
ARC	Ames Research Center
ASTER	Advanced Spaceborne Thermal Emission and Reflectance Radiometer
AVHRR	Advanced Very High Resolution Radiometer
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
CBRN	Chemical, Biological, Radiological, and Nuclear
CCRI	Climate Change Research Initiative
CCSP	Climate Change Science Program
CCTP	Climate Change Technology Program
CENR	Committee on Environment and Natural Resources
DAAC	Distributed Active Archive Center (Data Active Archive Center)
DFRC	Dryden Flight Research Center
DHS	Department of Homeland Security
DOD	US Department of Defense
DOE	US Department of Energy
DSS	Decision Support Systems
DST	Decision Support Tool
DTRA	Defense Threat Reduction Agency
EO-1	Earth Observing-1
EOS	Earth Observing Systems
EPA	US Environmental Protection Agency
ESG	Earth-Sun Gateway
ETA	Event Tree Analysis
ETM+	Enhanced Thematic Mapper Plus
FCMSSR	Federal Committee for Meteorological Services and Supporting Research
FEA	Federal Enterprise Architecture
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer
GIG	Global Information Grid
GIO	Geospatial Interoperability Office
GISS	Goddard Institute for Space Studies
GLOBE	Global Learning and Observations to Benefit the Environment
GMES	Global Monitoring for Environment and Security
GOES	Geostationary Operational Environmental Satellite
GOS	Geospatial One Stop
GPM	Global Precipitation Measurement
GRACE	Gravity Recovery and Climate Experiment
GSFC	Goddard Space Flight Center
HAZMAT	Hazardous Materials Response Division
HAZUS	Hazard- United States
HAZUS-MH	Hazard- United States - Multi-Hazard
HIU	Humanitarian Information Unit

HPAC	Hazard Prediction and Assessment Capability
HSOC	Homeland Security Operations Center
HSPD-5	Homeland Security Presidential Directive #5
HSTT	Homeland Security Tiger Team
Hydros	Hydrosphere State Mission
HYSPLIT	Hybrid Single-Particle Lagrangian Integrated Trajectory
IBPD	Integrated Budget and Performance Document
IBS	Integrated Benchmarked Systems
IMAAC	Interagency Modeling and Atmospheric Assessment Center
INSAR	Interferometric Synthetic Aperture Radar
IWGEO	Interagency Working Group on Earth Observations
JADPAT	Joint All-Hazards Dispersion Planning and Analysis Team
JAG	Joint Action Group
JCSDA	Joint Center for Satellite Data Assimilation
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
MM5	Mesoscale Model
MOA	Memorandum of Agreement
MODIS	Moderate Resolution Imaging Spectroradiometer
MOPITT	Measurements Of Pollution In The Troposphere
MSFC	Marshall Space Flight Center
NASA HQ	NASA Headquarters
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCEP	National Centers for Environmental Prediction
NEESPI	Northern Eurasia Earth Science Partnership Initiative
NESDIS	National Environmental Satellite Data Information Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPOESS	National Polar-Orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project/Net Primary Productivity
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
OAR	Office of Oceanic and Atmospheric Research
OFCM	Office of the Federal Coordinator for Meteorology
OMB	Office of Management and Budget
OR&R	Office of Response and Restoration
OSSE	Observing System Simulation Experiment
OSTP	Office of Science and Technology Policy
PART	Program Assessment Rating Tool
QuikSCAT	Quick Scatterometer
R2O	Research to Operations Network
R&D	Research and Development
REASoN	Research, Education, and Applications Solutions Network
RSAWG	Remote Sensing and Applications Working Group
SDR	Subcommittee on Disaster Reduction

SEA	State Enterprise Architecture
SeaWiFS	Sea-viewing Wide-Field-of-View Sensor
SRTM	Shuttle Radar Topography Mission
SSC	Stennis Space Center
TM	Thematic Mapper
TRMM	Tropical Rainfall Measurement Mission
UCAR	University Corporation for Atmospheric Research
USDA	US Department of Agriculture
USWRP	United States Weather Research Program
V&V	Verification and Validation

**NASA Science Mission Directorate**  
**Earth Science Division - Applied Science Program**  
***Homeland Security Program Element***

This document contains the Homeland Security Program Element Plan for FY 2007-2011.

This plan derives from direction established in the NASA Strategic Plan, Earth Science Enterprise and Space Science Enterprise Strategies, Earth Science Applications Plan, and OMB/OSTP guidance on research and development. The plan aligns with and serves the commitments established in the NASA Integrated Budget and Performance Document.

The Program Manager and the Applied Sciences Program Leadership have reviewed the plan and agree that the plan appropriately reflects the goals, objectives, and activities for the Program Element to serve the Applied Sciences Program, Earth Science Division, NASA, the Administration, and Society.

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Stephen Ambrose  
Program Manager, Homeland Security  
Applied Sciences Program  
NASA Earth Science Division

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Date

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Lawrence Friedl  
Lead, National Applications  
Applied Sciences Program  
NASA Earth Science Division

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Date

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Teresa Fryberger  
Director, Applied Sciences Program  
NASA Earth Science Division

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Date